

## lecture notes

### 1. Majority vs Plurality, Preference Schedule

Definition: **Plurality Winner** is the candidate with the most votes.

Definition: **Majority Winner** is the candidate with more than half of the votes.

Ten Alaskans are asked to vote on the “best” of four Alaskan villages.

Voters: Bishop, Claman, Dunbar, Giessel, Hughes, Kawasaki, Myers, Olson, Tobin, Wilson  
Villages: Adak, Bettles, Chevak, Diomede

(a) Given the vote below, who wins? Did they win a **majority**?

voter	Bishop	Claman	Dunbar	Giessel	Hughes	Kawasaki	Myers	Olson	Tobin	Wilson
vote	A	A	A	A	B	B	B	C	C	D

Majority? 10 voters. So  $50\% = \frac{10}{2} = 5$ .

Vote tally  

A	4
B	3
C	2
D	1

 the most votes.  
 So A is the plurality winner.  
 A wins

So a majority requires at least  $5+1=6$  votes.

So **No**, Candidate A did not win a majority

(b) Suppose, in a different world, they voters voted this way. Now what?

voter	Bishop	Claman	Dunbar	Giessel	Hughes	Kawasaki	Myers	Olson	Tobin	Wilson
vote	A	A	A	B	B	B	C	C	C	D

Q: What are some ways to handle ties?

Vote tally  

A	3
B	3
C	3
D	1

 a 3-way tie.  
 No plurality winner.  
 No majority winner.

(c) One option is to collect more information. See the new vote tally.

voter	Bishop	Claman	Dunbar	Giessel	Hughes	Kawasaki	Myers	Olson	Tobin	Wilson
1st choice	A	A	A	B	B	B	C	C	C	D
2nd choice	C	C	C	C	C	C	D	D	B	C
3rd choice	B	B	B	D	D	D	B	B	A	B
4th choice	D	D	D	A	A	A	A	D	D	A

Observe that the vote tally in part (c) can be usefully summarized as follows:

# votes	3	3	2	1	1
1st choice	A	B	C	C	D
2nd choice	C	C	D	B	C
3rd choice	B	D	B	A	B
4th choice	D	A	A	D	A

This is called a preference schedule

Q: Look at the preference schedule. Do you have an opinion about who should win? What seems fair?

## lecture notes

### 2. Fairness Criteria

Statements that seem like they should be true in a fair election.

#### Ex] The Majority Criterion

A candidate with more than 50% of the vote should win.

### 3. Condorcet Criterion

The winner of an election should win in every head-to-head match-up.

### 4. Condorcet Winner

A candidate who wins every head-to-head match-up is called the Condorcet Winner.

5. Show that Chevak (C) is the Condorcet Winner in the vote tally summarized in part 1d (and copied below).

→ Q: What do we need to show?

# votes	3	3	2	1	1
1st choice	A	B	C	C	D
2nd choice	C	C	D	B	C
3rd choice	B	D	B	A	B
4th choice	D	A	A	D	A

Answer: C would win against A.  
and against B.  
and against D.

Work

C vs. A

3	3	2	1	1
A	C	C	C	C

$$\text{tally } \begin{array}{|c|c|} \hline A & 3 \\ \hline C & 3+2+1+1=7 \\ \hline \end{array}$$

C wins ✓

C vs. B

3	3	2	1	1
C	B	C	C	C

$$\text{tally } \begin{array}{|c|c|} \hline B & 3 \\ \hline C & 3+2+1+1=7 \\ \hline \end{array}$$

C wins ✓

C vs. D

3	3	2	1	1
C	C	C	C	D

$$\text{tally } \begin{array}{|c|c|} \hline C & 3+3+2+1=9 \\ \hline D & 1 \\ \hline \end{array}$$

C wins ✓